WHAT IS CLAIMED IS:

1. A method for forming an aluminide coating on a turbine engine component having an external surface and an internal cavity defined by an internal surface that is connected to the external surface by at least one hole, the method being conducted in a vapor coating container having a hollow interior coating chamber, the method comprising the steps of:

(a) loading the coating chamber with the component to be coated;

(b) heating the loaded coating chamber to a temperature of from about 240°C to about 450°C;

(c) flowing a tri-alkyl aluminum coating gas into the heated coating chamber at a pressure of from about 50 to about 2000 mtorr (about 0.68 to about 27 kgf/m^2) for from about 0.25 to about 4 hours to deposit an aluminum coating on the external and internal surfaces of the component; and then

(d) heating the coated component in a nonoxidizing atmosphere to a temperature of from about 500°C to about 1100°C to form an aluminide coating on the external and internal surfaces of the component.

2. The method of claim 1 wherein the aluminum coating gas is a tri-C_3-C_5 alkyl aluminum gas.

3. The method of claim 2 wherein the aluminum coating gas is tri-butyl aluminum gas.

4. The method of claim 1 wherein during step (b) the loaded coating chamber is heated at a temperature of from about 250°C to about 300°C.

5. The method of claim 4 wherein during step (c), the tri-alkyl aluminum coating gas is flowed at a pressure of from about 250 to about 700 mtorr (about 3.4 to about 9.5 kgf/m^2) for from about 0.5 to about 2 hours.

6. The method of claim 5 wherein the aluminum coating gas is tri-C_3-C_5 alkyl aluminum gas.

7. The method of claim 6 wherein during step (d), the coated component is heated in a vacuum to a temperature of from about 640°C to about 700°C.

8. The method of claim 1 further comprising a step (e) of maintaining the component at a temperature of from about 450°C to about 1100°C in the presence of oxygen to form an oxide coating on the external and internal surfaces of the component.

9. The method of claim 8 wherein the temperature during step (e) is from about 600°C to about 800°C.

10. The method of claim 7 further comprising a step (e) of maintaining the component at a temperature of from about 600°C to about 800°C in the presence of oxygen to form an oxide coating on the external and internal surfaces of the component.

11. The method of claim 1 wherein the turbine engine component is a turbine engine blade having an external surface and an internal cooling cavity defined by an internal surface that is connected to the external surface by cooling holes.

12. The method of claim 11 wherein the aluminide coating on the internal surface of the blade is less than about 0.003 inches (less than about 76.2 microns) thick in the airfoil body portion and less than about 0.0015 inches (less than about 38.1 microns) thick in the root portion.

13. The method of claim 12 wherein the aluminide coating on the external surface of the blade is from about 0.0015 to about 0.003 inches (from about 38.1 to about 76.2 microns) thick in the airfoil body portion.

14. The method of claim 13 wherein during step (c) the coating chamber is maintained at a temperature of from about 250°C to about 300°C while a tri-C_3-C_5 alkyl aluminum coating gas is flowed into the chamber at a pressure of from about 250 to about 700 mtorr (about 3.4 to about 9.5 kgf/m^2) for from about 0.5 to about 2 hours, and the temperature during step (d) is maintained at from about 600°C to about 900°C.

15. The method of claim 14 wherein the pressure during step (c) is from about 450 to about 550 mtorr (about 6.1 to about 7.5 kgf/m^2), the temperature during step (d) is from about 640°C to about 700°C, and the temperature during step (e) is from about 600°C to about 800°C.

16. The method of claim 15 further comprising a step (e) of maintaining the component at a temperature of from about 600°C to about 800°C in the presence of oxygen to form an oxide coating on the external and internal surfaces of the component..

17. A method for forming an aluminide coating on a turbine engine blade having an external surface and an internal cooling cavity defined by an internal surface that is connected to the external surface by cooling holes, the method being conducted in a vapor coating container having a hollow interior coating chamber, the method comprising the steps of:

(a) loading the coating chamber with the blade to be coated;

(b) heating the loaded coating chamber to a temperature of from about 240°C to about 450°C;

(c) flowing a tri-alkyl aluminum coating gas into the heated coating chamber at a pressure of from about 50 to about 2000 mtorr (about 0.68 to about 27 kgf/m^2) for from about 0.25 to about 4 hours to deposit an aluminum coating on the external and internal surfaces of the blade;

(d) heating the coated blade in a nonoxidizing atmosphere to a temperature of from about 500°C to about 1100°C to form an aluminide coating on the external and internal surfaces of the blade; and then

(e) maintaining the blade at a temperature of from about 450°C to about 1100°C in the presence of oxygen to form an oxide coating on the external and internal surfaces of the blade;

wherein the aluminide coating has a thickness of from about 0.0015 to about 0.003 inches (from about 38.1 to about 76.2 microns) on the external surface of the blade in the airfoil body portion, and has a thickness of from about 0.0005 to about 0.0015 inches (from about 12.7 to about 38.1 microns) on the internal surface of the blade.

18. The method of claim 17 wherein the aluminum coating gas is a tri-C_3-C_5 alkyl aluminum gas.

19. The method of claim 18 wherein the aluminum coating gas is tri-butyl aluminum gas.

20. The method of claim 17 wherein, during each of steps (b) and (c), the loaded coating chamber is maintained at a temperature of from about 250°C to about 300°C.

21. The method of claim 17 wherein during step (c) the coating gas is flowed at a pressure of from about 250 to about 700 mtorr (about 3.4 to about 9.5 kgf/m^2) for from about 0.5 to about 2 hours.

22. The method of claim 17 wherein during step (d) the coated blade is heated to a temperature of from about 600°C to about 900°C for from about 0.75 to about 2 hours.

23. The method of claim 17 wherein the temperature during step (e) is from about 600°C to about 800°C.

24. The method of claim 23 wherein the aluminum coating gas is tri-C_3-C_5 alkyl aluminum gas.

25. The method of claim 24 wherein, during each of steps (b) and (c), the loaded coating chamber is maintained at a temperature of from about 250°C to about 300°C.

26. The method of claim 25 wherein during step (c) the coating gas is flowed at a pressure of from about 450 to about 550 mtorr (about 6.1 to about 7.5 kgf/m^2) for from about 0.75 to about 1.5 hours.

27. The method of claim 26 wherein during step (d) the coated blade is heated to a temperature of from about 640°C to about 700°C for from about 0.75 to about 2 hours.

28. A method for forming an aluminide coating on a turbine engine blade having an external surface and an internal cooling cavity defined by an internal surface that is connected to the external surface by cooling holes, the method being conducted in a vapor coating container having a hollow interior coating chamber, the method comprising the steps of:

(a) loading the coating chamber with the blade to be coated;

(b) heating the loaded coating chamber to a temperature of from about 250°C to about 300°C;

(c) flowing a tri-C_2-C_5 alkyl aluminum coating gas into the heated coating chamber at a pressure of from about 450 to about 550 mtorr (about 6.1 to about 7.5 kgf/m^2) for from about 0.5 to about 2 hours to deposit an aluminum coating on the external and internal surfaces of the blade;

(d) heating the coated blade in a vacuum to a temperature of from about 640°C to about 700°C to form an aluminide coating on the external and internal surfaces of the blade; and then

(e) maintaining the blade at a temperature of from about 600°C to about 800°C in the presence of oxygen to form an oxide coating on the external and internal surfaces of the blade.

29. The method of claim 28 wherein the aluminum coating gas is tri-butyl aluminum gas.

30. The method of claim 29 wherein the aluminide coating has a thickness of from about 0.0015 to about 0.003 inches (from about 38.1 to about 76.2 microns) on the external surface of the blade in the airfoil body portion, and has a thickness of from about 0.0005 to about 0.0015 inches (from about 12.7 to about 38.1 microns) on the internal surface of the blade.